CALIFORNIA
ENERGY
COMMISSION

Distributed Generation Strategic Plan

June 2002
P700-02-002

Gray Davis, *Governor*

CALIFORNIA ENERGY COMMISSION

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Presiding Member

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ACKNOWLEDGEMENTS

The Energy Commission thanks the following individuals for their substantial contributions to the development of the *Strategic Plan for Distributed Generation*. We would like to express our appreciation to Scott Tomashefsky and Mignon Marks, who were the principal authors of this plan.

We acknowledge the efforts of the PIER Energy Systems Integration team, specifically Laurie ten Hope and Mark Rawson. Their work on distributed generation during the past year made the development of this plan considerably easier. We also thank Terry Surles for making them available to this effort. Appreciation also goes to Jairam Gopal for his contributions related to the California Alliance for Distributed Energy Resources, Darcie Houck for legal assistance with respect to the preparation of this plan, and Ellie Townsend-Hough for review and coordination. Nancy Hassman provided Web Site support for the strategic planning process.

We thank all of the participants in the February 5th workshop and the May 22nd hearing. We specifically acknowledge parties who provided comments and who met individually with Energy Commission representatives to discuss this plan, including the following:

- Advanced Energy Systems/21st Century Design Associates
- California Air Resources Board, Stationary Fuel Cell Collaborative
- California Dept. of General Services
- California ISO
- CPUC Office of Ratepayer Advocates
- Center for Energy Efficiency and Renewable Technologies
- City of Oakland
- Cummins West, Inc.
- Edan Prabhu
- Emergent Energy Group
- Engage Networks, Inc.
- Fuel Cell Energy
- Green INQ
- Int'l Power Tech & Planergy Int'l
- Plug Power, Inc. (KP Advocates)
- Kawasaki
- Local Government Commission
- Mesa Verde Associates
- Natural Resources Defense Council
- Northern California Community Technologies
- Pacific Gas and Electric
- Power Innovators
- Real Energy
- Rita Norton & Associates
- Silicon Valley Manufacturing Group, DER Subcommittee
- Solar Turbines
- Southern California Edison
- Sustainable Conservation
- Tecogen, Inc. and *American*DG
- Tristar Power

We also wish to thank our sister agencies for their valuable input to this plan, including the California Public Utilities Commission (CPUC), the California Power Authority (CPA), the California Air Resources Board (CARB), and the Department of General Services (DGS). Specific thanks go to Valerie Beck, Michelle Cooke, and Julie Fitch at the CPUC, Tracy Saville and Jeanne Clinton at the CPA, Richard Corey at the CARB, and Jonathan Teague at the DGS.

Finally, we wish to thank each and every member of the Rule 21 Interconnection Working Group for their continued trust in our handling of interconnection rule development in California and its willingness to share industry insight. Their efforts have allowed us to more effectively bridge the gap between policy and its applicability in the field.

FOREWORD

This document contains recommended policies and strategies for the State of California to consider regarding the subject of distributed generation and the State's role in regard to it.

Oversight of this plan was performed under the direction of the Energy Commission's Environmental and Energy Infrastructure and Licensing Committee (Committee), as agreed upon by the five-member Energy Commission at its December 5, 2001 business meeting. The Committee consists of Robert A. Laurie (Presiding Member) and Robert Pernell (Associate Member).

The Committee solicited input from the distributed generation industry stakeholders and other interested parties at a public workshop held on February 5, 2002. Participants were asked to respond to a list of questions about the scope of the plan and to comment on a draft plan outline. After receiving comments at this workshop, the Committee released a draft *Strategic Plan for Distributed Generation* on May 1, 2002. A Committee hearing was subsequently held on May 22, 2002 to hear comments on the draft plan. The Committee published its final plan on June 4, 2002, after carefully considering the comments received both orally and in writing from workshop and hearing participants and from published information on distributed generation issues and opportunities. The Energy Commission unanimously approved this plan at its June 12, 2002 business meeting.

INTRODUCTION

We are at the threshold of reinventing the electric power system.[1]

The distributed generation industry is at a crossroads: it can emerge from its infancy to become a major contributor to California's electric system or it can remain on the sidelines, serving niche markets for remote, emergency, or other special power needs. When the state teetered on the verge of rolling blackouts last year, consumers became more aware of the need for peak-load reduction, increased power quality and grid reliability, which are key features offered by distributed generators. At present, more than 2,000 megawatts of distributed generation facilities have been installed in California, with an expected 300-400 megawatts in small-scale projects to be added on an annual basis in the near term.[2]

As the number of distributed generation projects grows in California and optimism increases about the potential benefits that these technologies could provide, so do concerns about the impact that wide-scale deployment of distributed generation might have on the future performance of the California energy system and the environment. This strategic plan is based on the fundamental hypothesis that distributed generation technologies can be deployed to benefit California's electric grid, energy consumers, and the environment. Initial research and assessments — included in this strategic plan — are being conducted or will be conducted to determine the validity of this hypothesis. The results of this analytical work will be used to update the contents of this plan, as needed.

This document articulates the Energy Commission's vision of the future relating to distributed generation, identifies issues and opportunities affecting the likelihood of that vision being realized, and addresses the role that government can play in this process. It considers potential roles for the Energy Commission and provides guidance to other State agencies about policies and programs within their respective jurisdictions which would contribute to helping the Energy Commission realize its vision for distributed generation.

Before presenting the elements of the strategic plan, this document presents the following, relevant background information on distributed generation: definition of DG, overview of DG technologies and enterprises, current DG issues, and possible roles for government to address the issues and opportunities. The elements of the plan are its vision, mission and principles statements, strategies, goals, activities, and guidance to other State agencies.

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1 Deblasio, Richard D. and Basso, Thomas S. *Status on Developing IEEE Standard P1547 for Distributed Power Resources and Electric Power Systems Interconnection*, March 2002.

2 See California Energy Commission. *Five-Year Investment Plan, 2002 Through 2006 for the Public Interest Energy Research Program*, P.600-01-004b, March 2001.

DG TECHNOLOGY AND MARKET OVERVIEW

All electrons are not created equally.[3]

Distributed generation (DG) has been defined in many ways, creating some confusion in terms of regulatory rule applicability. It is most commonly defined as the generation of electricity near the intended place of use. Some parties define it with size limitations, other exclude back up generation, and yet others make no distinction between generation connected to the transmission system or the distribution system. The Energy Commission assumes the following definition:

> *DG is electric generation connected to the distribution level of the transmission and distribution grid usually located at or near the intended place of use.*

The definition is fundamentally consistent with the CPUC's definition identified in its distributed generation roadmap decision, D. 99-10-065. The definition has been expanded in this document, reflecting the value of placing distributed generation near the point of use. While distributed generation is inherently related to local transactions vis-à-vis activities that may otherwise be construed to be in interstate commerce, the definition is not designed to preclude the use of distributed generation at the transmission level if the economics of doing so are warranted.

DG systems can be sized to meet a facility's total electrical requirements or they can be sized to partially replace or supplement electrical service from the grid. DG systems typically range in size from less than a kilowatt to tens of megawatts, although an individual unit's generating capacity depends on allocable space and size of load.

Distributed generation has many applications. The most common use of DG is for backup power whenever the normal source of electricity fails. The California Building Standards Code *requires* standby or emergency power systems serve specific types of equipment within specific types of buildings. Electrical loads which *must* be served during a power failure or interruption are those which could create a public health and safety hazard or hamper rescue or fire-fighting operations.

Industrial and commercial building owners, farms, and homeowners may also install *optional* standby power generators and uninterruptible power supplies. These DG systems serve electric loads which, if cut off from the normal power supply, could cause discomfort, serious interruption of a process, or damage to the product or process. One niche market for DG is in providing highly reliable power quality to electronic equipment, which is vulnerable to voltage fluctuations. DG equipment may be complemented with electric storage and switching equipment to provide a seamless transition between the grid and an on-site power supply.

Finally, distributed generation can be used as a primary source of electricity, essentially reducing or even eliminating reliance on the utility for electric service. When customer sites are remote and not served by the electric grid, DG can be a cost-effective alternative —for both the electric customer and the utility — to extending the distribution line to serve the new load. Similarly, on-site power

[3] Comment made by Jeff Byron at the Silicon Valley Manufacturing Group Distributed Energy Workshop, March 5, 2002.

supplies provide electric service to very small loads, such as roadside call boxes, more cost-effectively than the grid.

Distributed generation is available using a variety of technologies. The following briefly describes the most prevalent types of technologies commercially available:

INTERNAL AND EXTERNAL COMBUSTION ENGINES

Internal combustion engine generators for distributed power applications, commonly called gensets, are found in sizes from less than five kilowatts to over seven megawatts. Gensets are frequently used as a backup power supply in residential, commercial, and industrial applications. When used in combination with a 1-5 minute uninterruptible power supply, the system is able to supply seamless power during a utility outage. In addition, large IC engine generators may be used as base load, grid support, or peak-shaving devices.

A conventional combustion turbine generator is one type of internal combustion engine. Combustion turbines, or gas turbines, typically range in size from about 500 kilowatts to 25 megawatts for distributed generation, and up to approximately 190 megawatts[4] for central station power generation. They are fueled by natural gas, oil, or some combination of fuels. Modern, simple-cycle combustion turbine units typically have efficiencies in the range of 20-45 percent at full load. Efficiency is somewhat lower at less than full load.

Gas turbines are relatively inexpensive compared with other distributed generation options. Combustion turbine capital costs range from $300-$1,000 per kilowatt and tend to increase with decreasing power output. When compared with reciprocating engines, combustion turbines tend to cost more, but the penalty is less at the larger sizes. These costs have remained fairly stable in recent history, showing less than a five- percent increase over the past three years.

Installation costs, balance-of-plant equipment costs and other miscellaneous costs can be expected to increase first costs by 30-50 percent. Because of their high fuel gas pressure requirements, combustion turbines often require natural gas compressors, which is an example of balance-of-plant equipment, unless they happen to be near high-pressure cross-country pipelines. Compressors increase first costs by 5-10 percent. Adding heat recovery capabilities for cogeneration use increases the capital cost by $100-200 per kilowatt. Including other balance-of-plant components, the typical installed cost of a mid-sized gas turbine with a heat recovery unit will be in the $1,000-1,200 per kilowatt range.

Reciprocating engines are another example of internal combustion engines, which are widely available today. This is the most commonly used technology for distributed generation. The technology is mature, and reciprocating engines are manufactured inexpensively in large quantities.

Reciprocating engines can operate on a wide spectrum of fuels including natural gas, diesel, landfill gas, digester gas, etc. Larger engines may last for 20-30 years while smaller engines (< 1 megawatt) tend to have shorter life spans. Reciprocating engines have efficiencies that range from 25-45

[4] Siemens Westinghouse 501F.

percent. In general, diesel engines are more efficient than natural gas engines because they operate at higher compression ratios.

Microturbines are small combustion engines that produce between 25-500 kilowatts of power. Microturbines were derived from turbocharger technologies found in large trucks or the turbines in aircraft auxiliary power units. Most microturbines are single-stage, radial flow devices with high rotating speeds of 90,000-120,000 revolutions per minute. However, a few manufacturers have developed alternative systems with multiple stages and/or lower rotation speeds.

Commercial microturbines produce both heat and electricity on a relatively small scale. The fuel-energy-to-electrical-conversion efficiencies are in the range of 20-30 percent. These efficiencies are attained when using a recuperator (a device that captures waste heat to improve the efficiency of the combustion stage). Cogeneration is an option in many cases where a microturbine is located at the point-of-power utilization. The combined thermal and electrical efficiency of microturbines in such cogeneration applications can reach as high as 85 percent depending on the heat process requirements. Nonrecuperated microturbines have lower efficiencies at around 15 percent.

Microturbine capital costs range from $700-1,100 per kilowatt. These costs include all hardware, associated manuals, software, and initial training. Adding heat recovery increases the cost by $75-350 per kilowatt. Installation costs vary significantly by location but generally add 30-50 percent of the total installed cost.

Stirling engines are external combustion engines. They are sealed systems with an inert working fluid, usually either helium or hydrogen. They are generally found in small sizes (1-25 kilowatts) and are currently being produced in small quantities for specialized applications.

Stirling-cycle engines were patented in 1816 and were commonly used prior to World War I. They were popular because they had a better safety record than steam engines and used air as the working fluid. As steam engines improved and the competing, compact Otto cycle internal-combustion engine was invented, Stirling engines lost favor. Recent interest in distributed generation and use by the space and marine industries has revived interest in Stirling engines and as a result, research and development efforts have increased.

Capital costs of Stirling engines ($2,000-50,000 per kilowatt) are generally not competitive with other distributed generation technologies. Stirling engines are currently manufactured in very low quantities which results in the high capital cost. At the high end of the cost range are Stirling engines for very specialized (e.g., space) applications. Developers are working to lower first costs through a combination of design refinements and material substitution.

FUEL CELLS

There are four fuel cell technologies at varying states of commercial readiness: phosphoric acid, molten carbonate, solid oxide, and proton exchange membrane. Fuel cells use hydrogen and oxygen as the primary reactants; however, they can operate on a variety of fuels depending on the type of fuel process and reformer used.

Natural gas (methane) is considered to be the most readily available and the cleanest fuel (next to hydrogen) for distributed generation applications, so most work is focused on natural-gas-powered fuel cells. However, fuel cells need hydrogen gas to operate and therefore require the conversion of natural gas into a hydrogen-rich gas. In low-temperature fuel cells, this conversion is accomplished using a reformer. High-temperature fuel cells do not require a reformer since the high operating temperature of the fuel cell allows for the direct conversion of natural gas to hydrogen.

PHOTOVOLTAIC (PV) CELLS

Photovoltaic cells convert sunlight directly into electricity. They are assembled into flat plate systems that can be mounted on rooftops or other sunny areas. They generate electricity with no moving parts, operate quietly with no emissions, and require little maintenance. However, the cost is currently too high for bulk power applications.

A photovoltaic cell is composed of several layers of different materials. The top layer is a glass cover or other encapsulant to protect the cell from weather conditions. Below this protective layer is an anti-reflective layer to prevent the cell from reflecting the light away.

Photovoltaic systems are available in the form of small rooftop residential systems (less than 10 kilowatt), medium-sized systems in the range of 10-100 kilowatt, and larger systems above 100 kilowatt connected to utility distribution feeders. The federal government launched a program to encourage the installation of one million rooftop photovoltaic arrays by 2010.

WIND TURBINES

Wind turbines use the wind to produce electrical power. A turbine with fan blades is placed at the top of a tall tower. The tower is tall in order to harness the wind at a greater velocity, free of turbulence caused by interference from obstacles such as the ground, trees, hills and buildings. As the turbine rotates in the wind, a generator produces electrical power. A single wind turbine can range in size from a few kilowatts to more than five megawatts. A typical life of a wind turbine is 20 years. Maintenance is required at 6-month intervals.

Generally, individual wind turbines are grouped into wind farms containing several turbines. Many wind farms range from a few megawatts to tens of megawatts and have annual capacity factors ranging from 20-40 percent. Wind farms or smaller wind projects may be connected directly to utility distribution systems. The larger wind farms are often connected to sub-transmission lines. The small-scale wind farms and individual units are typically defined as distributed generation. Residential systems (5-15 kilowatts) are available; however they are generally not suitable for urban or small-lot suburban homes due to large space requirements.

THE ORIGINS OF DISTRIBUTED GENERATION IN CALIFORNIA

Distributed generation existed well before the development of the electric transmission grid. The concept was reintroduced in the 1970s, although the term of "distributed generation" was not coined until the 1990s.[5] Public interest in environmental protection favored the "soft energy path"— a vision of the future in which conservation and renewable energy completely replaced an electric system based on large, nuclear and fossil-fueled power plants.[7] Natural gas was included in this vision as a transition fuel until renewable technologies could take over.

The Public Utilities Regulatory Policy Act (PURPA) of 1978 initiated California's first steps along the "soft energy path." PURPA encouraged ownership of electric generating facilities by independent energy producers rather than by electric utilities. Furthermore, it guaranteed a market for the electricity from PURPA "qualifying facilities" (QF) by compelling the utilities to purchase their power under long-term contracts. More than 5,000 MW of renewable energy and gas-fired co-generation facilities were built in California due to PURPA and to federal and state tax benefits for solar electric and wind energy facilities. Most of these qualifying facilities, however, were interconnected to utility high-voltage transmission systems, rather than to lower-voltage distribution systems. Remotely sited wind farms and solar thermal facilities are not considered distributed generation, while the QF cogeneration facilities could be.

In the 1980s, the CPUC, through the Biennial Resource Plan Update, attempted to acquire 1,500 MW of new electric supplies from PURPA qualifying facilities but the Federal Energy Regulatory Commission (FERC) halted this process based on utility concerns about the cost.

In the 1990s, prior to electric industry restructuring, California's three investor-owned utilities were conducting ratepayer-funded research, development and demonstration programs. Pacific Gas and Electric Company's RD&D program can be credited with advancing the concept of "distributed generation" and with conducting the very first field demonstrations of solar photovoltaics to enhance electric grid reliability. Its vision of the future was a utility electric system which included not only central station power plants, but also small, clean, and mass-produced distributed generation technologies to reduce peak demand, enhance voltage stability, help avoid line losses, and improve customer relations. The investor owned utilities significantly downsized their R&D programs in anticipation of electric industry restructuring.

California's law to restructure its regulated electric utility industry created "public purpose" programs, including two administered by the Energy Commission which directly affect distributed generation: the Renewables Program and the Public Interest Energy Research (PIER) program. The Legislature established these programs to ensure continued ratepayer funding for them after restructuring. Both programs provide ratepayer subsidies to developers or users of distributed generation facilities or technologies.

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5 The term "distributed generation" was first coined by the research and development (R&D) staff of Pacific Gas and Electric Company, according to Susan Horgan, Distributed Utility Associates, testimony given at Energy Commission Workshop on the Distributed Generation Strategic Plan, February 5, 2002.

7 Lovins, Amory. *Friends of the Earth's Not Man Apart,* Energy Strategy: The Road Not Taken? 1976.

Concurrent with the administrative and legislative proceedings to deregulate electric markets, the Energy Commission helped to form the California Alliance for Distributed Energy Resources (CADER) to address DG equipment manufacturers' concerns about environmental permitting, interconnection rules, and other regulatory and market barriers for their products.

In December 1998, CADER persuaded the CPUC to open a rulemaking on distributed generation to identify institutional and regulatory barriers to distributed generation. CADER members have also been effective in implementing specific issues in the California Legislature. In recent sessions, new laws were enacted to expand eligibility for "net metering" programs, provide funds for DG applications, reduce utility rate disincentives, initiate statewide emission standards for the smallest DG units and to unify permitting rules among air districts.

In the aftermath of California's recent energy crisis, the Legislature created the California Power Authority (CPA) as a financier or owner of electric generating facilities. As part of its work, CPA recently solicited proposals from DG vendors to provide equipment and services for DG projects on publicly-owned buildings throughout the state. The three DG technologies selected for public-facility use by the CPA were: microturbines, including microturbines in combined heat and power applications; fuel cells; and "decentralized" solar photovoltaics. DG programs are now active in a number of State agencies, including the CPUC's self-generation program.

CURRENT REGULATORY INTEREST IN DG

In late 1998, the Energy Commission and the CPUC began a collaborative effort to address outstanding issues related to distributed generation. As part of that effort, standardized interconnection rules have been adopted, incentive programs for self-generation have been initiated, net metering programs have been expanded, and policies surrounding standby rates have been established.

The CPUC's ongoing distributed generation investigation, R.99-10-025, is the forum for resolving many of these state policies surrounding distributed generation. In particular, that proceeding addressed the following issues:

- developing definitions for distributed generation and distributed energy resources (DER);
- determining ownership and control of distributed generation;
- developing interconnection standards for distributed generation and DER;
- defining the role of the utilities in distributed generation;
- considering the impacts distributed generation and DER may have on the environment and on distribution system reliability; and
- addressing rate design and cost allocation issues.

The evidentiary record was developed during calendar year 2000, with a reasonable expectation that the CPUC would reach a final decision in the early part of 2001. Unfortunately, the expected timeframe was not attainable due to the need to redirect resources towards the resolution of issues surrounding the energy crisis. As 2002 has arrived along with a better supply/demand outlook for electricity, many of these issues are now being addressed again.

In addition to the CPUC's regulatory activities, the California Legislature passed a law to address public concern about emissions from distributed generation facilities.[8] The California Air Resources Board (CARB) recently adopted air emissions standards applicable to distributed generation units in response to Senate Bill 1298. CARB will certify distributed generation units that are not currently subject to local air district rules and require manufacturers to meet clean emission standards. New units will be required to meet two stages of emission standards, the first in 2003 and the second in 2007. In addition, CARB has provided a guidance document to California's 35 local air districts for power plants less than 50 megawatts.

STATUS OF DG IN CALIFORNIA

INSTALLATIONS

In California, more than 2,000 megawatts can be classified as distributed generation. Emergency backup generators add another 3,000 megawatts of distributed generation to the total. Most of the generation capacity is technologically grouped as internal combustion engines, with individual units often producing in excess of one megawatt. Although the magnitude of generation capacity available is small, the vast majority of physical DG installations throughout the state is renewable-based (solar photovoltaics) and often associated with utility net-metering programs. In formal filings submitted to the CPUC in September 2001, Southern California Edison (Edison) classified more than 500 generating units as distributed generation as did Pacific Gas and Electric (PG&E). San Diego Gas and Electric's (SDG&E) distributed generation inventory includes half of that amount.[9]

Since the approval of new interconnection rules in California, several hundred megawatts of new projects have been proposed. From January 2001 through May 2002, 192 distributed generation projects were proposed throughout the state, representing more than 400 megawatts of new generation. Of that amount, 101 megawatts are now operational, with the remainder pending authorization to interconnect (see Table 1). This estimate does not include hundreds of small-scale renewable distributed generation projects that are eligible for net metering under CPUC rules[12] or any generators installed for emergency back-up.

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[8] Formerly SB 1298 (Bowen), now Chapter 741, Statutes of 2000.

[9] The figures are based on filings submitted by PG&E, SDG&E, and SCE in their standby rate design applications before the CPUC, Applications 01-09-015, 01-09-016, and 01-09-017, respectively.

[12] The numbers in Table 1 include projects proposed under Rule 21. Renewable projects under 10 kilowatts are not treated under CPUC Rule 21 and therefore not included in the total.

Table 1
Distributed Generation Connects in Investor-Owned Utility Service Territories (Megawatts)

Utility	Operational	Proposed
Edison	766	215
PG&E	1,385	71
SDG&E	219	20
Total	2,370	306

Sources: 1) California Energy Commission, Utility annual generation filings. 2) DG Interconnection Status Reports, as submitted to the Rule 21 Working Group, May 2002.

DG ENTERPRISES

Like the rest of the California electricity market, distributed generation entities operating in California have had their share of ups and downs during the past three years. During 2000, alternative energy firms raised $2 billion from initial public offerings and venture capitalists, according to the research firm Clean Edge.[13] In April 2001, investment research firms predicted that microturbine, fuel cell, and solar photovoltaics companies would grow significantly due to a "vast confluence of political, technological, and social forces that make clean energy a compelling investment strategy."[14] As a result, investors bought stock in publicly held companies specializing in these areas and investment firms created mutual funds, specializing in energy technology companies.

Issuance of these funds was well-timed to coincide with California's electricity crisis. Some analysts cautioned, however, that some of these investments would be "story stocks" – "unprofitable companies with a great story or concept that has made them Wall Street darlings…[but] not all of these story stocks will have happy endings."[15] Last summer, the value of many distributed generation stocks grew exponentially and then declined after realizing disappointing sales. Today, many distributed generation companies' stock prices remain relatively flat or are in a slow decline.

In addition to DG equipment manufacturers, the DG industry includes project developers, which may or may not be affiliates of equipment manufacturers. One California example is RealEnergy, which has installed more than four megawatts of DG facilities and has nearly nine megawatts of additional

13 "Venture Capital Chases the Next Big Thing, and Little Thing, in the Energy Industry, by Justin Pope, *Post-Gazett.com*, July 29, 2001.

14 *Clean Energy Markets: Five Trends to Watch in 2002*, Clean Edge and "Is Energy Technology the Next Big Thing," *Economist.com*, April 19, 2001.

15 "The Power and the Story: Breaking Down the Alternative Energy Plays," by Ian McDonald, *The Street.com*, February 2, 2001.

DG under construction as of April 2002. RealEnergy installs, implements, owns and operates DG projects in the commercial real estate sector under the terms of an energy services contract. DG project developers provide a valuable customer feedback to DG manufacturers, which helps them improve their products. Furthermore, they spur private investment in DG technologies, which help to reduce product costs.

The remainder of this section focuses on three types of distributed generation technology manufacturing companies having a significant impact on the California market: microturbines, fuel cells and solar photovoltaics.

MICROTURBINE COMPANIES

Microturbine companies are a subset of the turbine generator industry, with California having one of the largest employee bases for turbine developers in the nation.[16] Over the past two decades, the turbine industry has focused on producing gas turbines, combined-cycle, and combined-heat-and-power units. General Electric, Honeywell, ABB, and Westinghouse dominate the turbine industry. Starting in 1998, many of these companies obtained U.S. patents for various microturbine technologies, including Allied Signal, General Electric, Rolls Royce, Honeywell and ABB. Solar Turbines, a subsidiary of Caterpillar, is an example of a California-based turbine manufacturer active in the distributed generation industry. In addition to manufacturing its own products, Solar Turbines has been a major developer and supplier of recuperators for the microturbine industry.

In 1998, Capstone Turbines was the first company to offer commercial power products using microturbine technology, the result of more than 10 years of research and development. Capstone has its headquarters and assembly plant in Chatsworth, California and employs more than 200 people.

CPA's Request for Bids attracted responses from 23 companies interested in doing combined heat and power projects in California public facilities. Microturbine manufacturers participating in one or more of these bids include: Bowman Power Systems (a British company with a North and South American sales office in Southern California); Capstone Turbine Corporation, DTE Energy Technologies, Inc. (affiliated with Detroit Edison Company); Turbec (a wholly-owned subsidiary of Volvo Aero and ABB); and Ingersoll-Rand Energy Systems.

Honeywell (which merged with Allied Signal) was once a microturbine manufacturer, but it exited the microturbine business in 2001 because it did not see the market developing as quickly as it had originally expected.[17]

FUEL CELL COMPANIES

According to the results of CPA's recent Request for Bids for fuel cell vendors, 14 companies met the minimum requirements and will be invited to compete for future fuel-cell installation projects on

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16 "The New Turbine Industry – Thinking Outside the Grid," Drew Robb, *Energy Tech Online*, July/August 2000.

17 "Microturbines Lose Ground in DG Race," *DG Insight*, December 21, 2001.

public buildings. Vendors representing all four types of fuel cell technologies participated in this solicitation.

A major manufacturer of molten carbonate fuel cells is FuelCell Energy, a Connecticut-based company. In 2000, FuelCell Energy's stock gained more than 440 percent despite annual losses since 1998.[18] Its current manufacturing capacity is 50 megawatts per year and has formed a distribution partnership with Caterpillar, Chevron and CMS Viron.

UTC Fuel Cells, formerly International Fuel Cells, is a unit of United Technologies Corporation. United Technologies Corporation is a $28 billion company that provides products to the aerospace and building systems industries throughout the world. Its fuel cell subsidiary uses phosphoric acid fuel cell technology developed for the aerospace industry and is one of the largest companies in the world solely devoted to fuel cell technology. ONSI was also a subsidiary of United Technologies Corporation, but International Fuel Cells and ONSI were combined into UTC Fuel Cells.

Plug Power, Inc. is a designer and developer of on-site energy-generating systems, using proton exchange membrane fuel cells. It was established in 1997 as a joint venture between DTE Energy Company and Mechanical Technology Incorporated. Its products for residential and small commercial applications will be marketed through a joint venture with General Electric Company and DTE.

SOLAR PHOTOVOLTAICS COMPANIES

The solar photovoltaics industry has been doing business in California since the early 1980s. Much of the growth in demand for PV products, however, has occurred during the past five years. EPRI reported that 2001 was another "banner" year for photovoltaics. Until 1997, PV module production never exceeded 100 megawatts per year. In 1999, however, producers nationwide made and sold approximately 200 megawatts of modules, and last year nearly doubled that output despite a slowdown in the economy. As such, worldwide PV deployments are well on their way toward a second gigawatt.[19]

Strategies Unlimited, a market research firm in Mountain View, California, identified the following companies as leaders in the PV industry: Royal Dutch/Shell Group, Siemens, British Petroleum, Sanyo Electric, Sharp, Kyocera and AstroPower.

AstroPower is the only American company on this list, although all of these companies are active in the California PV market. It is headquartered in Newark, Delaware and is the world's largest independent manufacturer of solar electric power products. It develops, manufactures, markets and sells crystalline silicon cells, modules, panels and systems for generating solar electric power. AstroPower is part of the Standard & Poors SmallCap 600 and is ranked 39th on Business Week's Top 50 Standard & Poors SmallCap Company list for one- and three-year performance.

AstroPower has attracted a lot of media attention in California because of its success in forming alliances with a number of the state's largest production homebuilders to offer solar electric power as

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18 "New Power Generation? Fund Firms Bet Alternative Energy Will Be The New Sector Boom," by Ian McDonald, *The Street.com*, January 1, 2001.

19 Quarterly Status and Technical Progress Report, submitted by Ed Holt & Associates, Inc. to the National Association of Regulatory Utility Commissioners – Photovoltaic Collaboration, April 15, 2002.

a feature in new home construction. Its partners include Pardee Homes in San Diego, California and Premier Homes in Northern California.

PowerLight Corporation is another California-based solar PV company. It designs, assembles, and installs grid-connected, *commercial -scale* solar electric products and systems. The company was founded in 1991 and remains a privately-owned company. Its manufacturing facility in Berkeley makes the patented PowerGuard PV roof tile assembly for application on flat, commercial roofs. PowerLight's president, Tom Dinwoodie, reported that his company has doubled its revenues every year for the past five years, with revenues now exceeding $25 million annually.[20]

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20 "San Francisco Bond Issues Would Boost Funding for New Solar Power Capacity," by Jim Carlton, *Wall Street Journal*, November 6, 2001.

23 Office of Ratepayer Advocates, Comments on Strategic Plan Outline, February 21, 2002.

DEPLOYMENT ISSUES AND OPPORTUNITIES

Distributed generation has the capacity to rewrite the economic relationship between traditional distribution utilities and their customers.[23]

This section identifies the major barriers hindering deployment of distributed generation in California and offers a general strategy for resolving key issues. Barriers to DG deployment have been identified and explored extensively, most notably in a report prepared by the National Renewable Energy Laboratories (NREL) in May 2000.[24] In that report, NREL identifies a series of technical, regulatory, and institutional barriers that have slowed deployment and continue to do so today. Equally important was the report's development of an action plan that we provide as Table 2 below and embrace as a general framework for our own strategies:

TABLE 2
NREL's Ten Point Action Plan for Reducing Barriers to Distributed Generation

Technical Barriers
- Adopt uniform technical standards for interconnecting distributed power to the grid.
- Adopt testing and certification procedures for interconnection equipment.
- Accelerate development of distributed power control technology and systems.

Business Practice Barriers
- Adopt standard commercial practices for any required utility review of interconnection.
- Establish standard business terms for interconnection agreements.
- Develop tools for utilities to assess the value and impact of distributed power at any point on the grid.

Regulatory Barriers
- Develop new regulatory principles compatible with distributed power choices in competitive and utility markets.
- Adopt regulatory tariffs and utility incentives to fit the new distributed power model.
- Establish expedited dispute resolution processes for distributed generation project proposals.
- Define the conditions necessary for a right to interconnect.

Source: NREL, Making Connections: Case Studies of Interconnection Barriers and their Impact on Distributed Power Projects, NREL/SR-200-28053, May 2000, page iv.

While we fully support the conclusions of the NREL study, one additional element is important for a complete strategy assessment. Specifically, strategies surrounding market behavior, consumer education, and cost evaluation tools are imperative to effectively deploy distributed generation and must be included as critical strategies. Many of these issues are categorized in the sections that follow. Recognizing that the list of issues is not all-inclusive, it is not the intent of this plan to

24 Alderfer, R. Brent et al. *Making Connections: Case Studies of Interconnection Barriers and their Impact on Distributed Power Projects*, NREL/SR-200-28053, May 2000.

address each issue individually. The issues will be discussed as part of a general strategy, but many of the goals outlined toward the end of the report may seek to respond to a specific issue.[25]

INTERCONNECTION ISSUES

- *Can interconnection rules be standardized throughout California?*
- *Can interconnection be made more user-friendly to the end-use consumer?*
- *Can a substantial amount of DG be interconnected in both radial and networked distribution systems?*
- *Are there safe, reliable and cost-effective interconnection solutions for radial and networked distribution systems?*
- *Can interconnection solutions be deployed in a timely manner?*
- *Can engineering studies for interconnection be eliminated, standardized, or streamlined?*
- *Is a single DG unit compatible with end-use equipment or other DG equipment?*
- *Can qualified interconnection systems be certified so that they may be installed with minimal field-testing?*
- *Have potential DG installations been postponed or abandoned due to existing interconnection rules or costs?*

No distributed generation discussion is complete without addressing interconnection issues. Distributed generation conferences, regulatory proceedings, articles, and other points of discussion clearly identify the lack of interconnection standards as the primary barrier to entry. The effort to develop and implement statewide interconnection standards for DG is currently being led by the Energy Commission closely coordinated with the CPUC.

The Commission-led Rule 21 Interconnection Working Group recently developed standard interconnection rules, which were adopted by the CPUC. These rules govern how the investor-owned utilities review and interconnect distributed generation to their systems. A Working Group continues to meet to resolve ongoing issues related to interconnection. As PG&E mentioned in its comments submitted in March 2002, Energy Commission efforts have created "a good foundation from which to build policies to lead to more efficient interconnection practices. The root of this effort is the ongoing interconnection workshop process, which is comprised of utility representatives, DG vendors and manufacturers, regulatory representatives, and other interests. These workshops have proven to be a productive forum to openly exchange ideas and develop products that are in the interest of all parties."

PG&E also indicated that it might be useful for publicly owned utilities to adopt similar rules and suggest that legislation might be pursued to achieve this objective. The Energy Commission has already initiated discussions with municipal utilities about voluntarily adopting interconnection standards.

ENVIRONMENTAL ISSUES

- *What are the local population and environmental impacts from DG technologies and how can these impacts be minimized or mitigated?*
- *What are the regional population and environmental impacts of DG technologies and how can these impacts be minimized or mitigated?*
- *What are the environmental life-cycle impacts of DG compared to central station power plants?*

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25 It should be noted that many of the issues were conceived as part of the Energy Commission's PIER Research Assessment work performed last year under the direction of the Energy Systems Integration program. (See www.energy.ca.gov/reports/2002-02-015_600-01-016.pdf.)

- *What technologies and emission controls are needed to make air emissions from DG as clean as those from central station power plants by 2007?*
- *What would be the best way to promote waste-to-energy DG projects that help improve air/water quality and reduce greenhouse gases?*

The California Air Resources Board (CARB) is the State agency responsible for improving and maintaining air quality in California. CARB oversees all air pollution control efforts in California, including programs and activities of 35 local air pollution control districts. The Board has the authority and responsibility of ensuring that federal and state health-based air quality standards are achieved through a variety of controls for stationary, mobile, and small "area" sources of pollution. While CARB has regulatory authority over motor vehicles and other mobile sources such as non-road engines, local air districts regulate stationary sources, including distributed generation.

As mentioned previously in this strategic plan, CARB is implementing new regulations restricting the amount of emissions allowed from distributed generation units, which are smaller than local air district permitting thresholds. The emissions rule seeks to improve the emission profiles of distributed generation technologies so that they meet or exceed the emission profiles of state-of-the-art, natural-gas fired central station power plants.

Debate continues over where the focus of research should go. PG&E noted in previous comments on the strategic plan outline that it may be "preferable to spend research dollars on making these DG technologies competitive in an environmental sense with central station units, and not provide "clean" subsidies to units until they have proven they are really so. The Office of Ratepayer Advocates within the California PUC suggested that consideration be given to the value of combined heat and power projects. The Silicon Valley Manufacturing Group also acknowledges the need to promote clean technologies but cautions that long-term economic viability must also be considered.

GRID EFFECTS ISSUES

- *What are the beneficial/detrimental impacts of high-penetration DG on the T&D system and how may they be quantified and assessed for value?*
- *What are the limits to the level of DG that the grid can absorb without adverse impacts?*
- *What are the limitations on bi-directional power?*
- *Should the design of new distribution feeders consider DG?*
- *Can the concept of microgrids be made practical? Can they be effectively utilized?*

The Energy Commission and other organizations funding distributed generation research, development and demonstration are beginning to look at the impact that wide-scale deployment might have on the traditional grid system. Utilities are concerned that high penetration could be detrimental to the grid by requiring more complex protection schemes. Several research projects in the area are being funded at both the national and the local level. At the national level, DOE and the Energy Commission are major sponsors of the Distributed Utility Integration Test, commonly referred to as DUIT. This program is looking at the effects of large penetration of distributed generation on distribution systems.

Microgrids[26] are an area of heightened research interest. Concurrent with the technical evaluation of microgrids is a growing debate between the value that microgrids provide and whether the regulatory

[26] A microgrid is a grouping of small-scale generators that are owned and operated by energy users who are members of the microgrid. The microgrid is operated entirely or primarily in the customers' own interests and has only one point of interconnection with the utility grid.

framework would support wide-scale microgrid deployment. For example, PG&E in its comments state that microgrids should not be pursued as a matter of policy particularly when rate, reliability, safety and regulatory issues associated with such service has not yet been addressed. The utility argues that it would not be good public policy to encourage the establishment of a number of "mini-utilities without the full charter responsibilities that regulated utilities now have." ORA, on the other hand, supports the development of microgrids with continued regulatory oversight. It believes that microgrids are the "technological gateway" to wide-scale DG deployment on a plug-and-play basis.

MARKET INTEGRATION AND REGULATORY ISSUES

- *Is it in the State's interest to promote DG?*
- *How should market rules be modified to allow DG to better participate in current markets?*
- *How may transaction costs associated with obtaining permits for DG be reduced?*
- *How can tariffs and rates be designed to provide better price transparency to DG?*
- *Are there too many public subsidies being provided for DG?*
- *Should incentives for DG be further enhanced?*
- *Should regulatory rules be changed to support the development of microgrids?*
- *How does the suspension of direct access impact the marketability of DG?*
- *Are there ways to balance the imposition of "exit fees" with the marketability of DG?*
- *Should utilities be offered incentives in return for eliminating exit fees when DG is installed on their systems?*
- *Should standards for control/communications be developed to better enable DG to participate in markets?*
- *Should utilities be provided incentives to facilitate DG?*
- *Should utilities be allowed to install and use DG, participate with other DG developers, and if so how should this occur?*

This area is perhaps the most dynamically debated topic, as market design and regulatory issues evolve at a rapid pace both in California and the rest of the nation. Regulatory review with respect to distributed generation has been led by the CPUC, although the ISO has explored a number of DG program concepts for more than a year. Another aspect not generally addressed but important to note is the review provided by the state's publicly owned utilities, whose service territories account for more than 15 percent of electricity consumed in the state.

While policy advances and heightened interest in distributed generation have occurred at the state level, regulatory and institutional barriers surrounding the effective deployment of distributed generation remain. Major policy decisions have been delayed due to the need to respond to the myriad of energy crisis related activities during calendar years 2000 and 2001. Unfortunately, many of these actions have created new barriers and mixed signals to an industry still developing.

Based on discussions with a variety of consumer groups, developers, and financing institutions, it is believed that regulatory uncertainty in California continues to be a major concern for those considering the deployment of distributed generation. Utility rate design is confusing at best, including issues surrounding standby charges, interconnection fees, exit fees, and grid management charges. The timing of legislative mandates regarding rate design and the ultimate implementation of those policies also carry confusion and uncertainty to DG stakeholders.

The financial fallout surrounding the energy crisis has negatively impacted the deployment of distributed generation in California. Among the myriad of energy-related events affecting California during calendar years 2000 and 2001, a key issue impacting the distributed generation market is the recent decision by the state legislature to suspend direct access (ABX1 1 (Keeley, Chapter 4, Statutes of 2001), implemented by the CPUC effective September 20, 2001. Suspension of direct access effectively removes an important benefit from potential users of distributed generation: the ability to sell excess power to other retail customers within the parameters of Public Utilities Code Section 218. Without a retail market to supply, a DG user does not have any incentive to oversize a system and sell excess power to other retail customers. Ironically, even though options still are available to sell excess power in the wholesale market, customers with on-site generation no longer have an incentive to do so since excess power is now readily available on the spot market at prices below what would be economically attractive. Furthermore, customer generators are effectively precluded from exporting power to the grid. Market rules and utility regulation do not presently accommodate export into wholesale or retail markets.

From a public policy perspective, the inability to resolve the regulatory uncertainties runs counter to the desire to encourage business development in the state. That conclusion impacts all aspects of energy policy. However, clear policy direction with respect to distributed generation policy would at least provide some energy choices to consumers that only have limited energy procurement options.

POTENTIAL ROLE OF GOVERNMENT IN ADDRESSING ISSUES AND OPPORTUNITIES

Government roles with respect to DG can generally be organized into two broad categories: economic development efforts and regulatory activities. A variety of federal, state, and local government entities conduct economic development activities to foster industrial competitiveness, business development, or job creation or to pursue other public policy goals. California-based DG manufacturers and related businesses provide jobs and tax revenues which can benefit the economy. Furthermore, commercial and industrial DG facilities can make these businesses more profitable by reducing their energy costs or by enhancing power quality/reliability within their operations.

Consumer and environmental protection are the primary thrusts of government regulatory activity directly affecting the DG industry. Indirect regulatory activities, however, include CPUC regulation of utility rates and business practice and the federal government's regulations to maintain electric grid reliability.

Consumer protection activities affecting DG deployment include local government enforcement of building codes and standards. The California Building Code Standards provides minimum standards to protect public health and safety. In addition, the California Contractor State Licensing Board (CSLB) licenses and regulates contractors in 42 classifications[27] that constitute the construction industry. The staff of the CSLB field offices investigates consumer complaints against licensed and unlicensed contractors.

Environmental protection activities seek to mitigate potential negative impacts from equipment installation and operation. Local air districts regulate DG equipment that may cause a negative air quality impact. Other environmental issues are addressed through local governments (city or county) through the land-use permitting process. The California Environmental Quality Act (CEQA) requires preparation of an environmental document only when local zoning ordinances require a land-use permit. Building permitting and building code enforcement are CEQA-exempt processes.

ROLE OF STATE AGENCIES

In connecting these concepts to state government, we believe state government could play several key roles in addressing many of the issues described earlier in this plan. These roles are grouped into the following categories:

- Plan/Coordinate – State government could conduct specific energy-resource forecasts and needs assessments to determine where regional supply and demand imbalances exist. Forums could be created/continued to discuss distributed generation policy and deployment issues. Activities could also be coordinated among governmental entities to develop strategies, share ideas, and optimize resources.

[27] Including the solar contractor classification, C-46.

- Purchase – State government could procure distributed generation for use by government. Orders could be aggregated for distributed generation equipment among governmental entities and arrange for volume discounts from bulk purchases. Government-owned facilities could be utilized to demonstrate the costs/benefits of distributed generation technologies within the community.

- Provide incentives – State government could provide tax, financial or regulatory incentives to encourage deployment of distributed generation. It could also provide public funds to accelerate advances in science and technology through research, development and demonstration. Additional incentives could be offered to stimulate business entry and growth within California.

- Regulate – State government could impose environmental and consumer protection requirements upon developers of DG projects through the land-use, building, and air quality permitting processes. Testing and certification of DG equipment performance could be required. Utilities could be required to incorporate DG in distribution grid expansions, and/or modify rates and tariffs that do not discourage self-generation. Distributed generation could be recognized within California's Title 24 Building Energy Efficiency Standards.

- Educate/Train – State government could develop informational materials that could increase awareness and interest in DG technology. Analytical tools could be developed to assist consumers in evaluating and purchasing DG equipment/services, and to protect consumers from false performance claims or misrepresentations of government incentive programs. Technical training programs for DG installers and facility operations and maintenance personnel could be developed. Technology transfer activities could be performed to disseminate results from publicly funded research, development and demonstration (RD&D) programs.

- Conduct research – State government could conduct scientific research. For example, it could research and identify potential environmental impacts of DG and then determine appropriate actions to minimize or mitigate the negative impacts on human populations and the environment.

- Be Entrepreneurial – State government could provide DG services that are not otherwise provided by the private sector or regulated utilities. This activity might be done to demonstrate the viability of marketing DG products/services within an under-served geographic location or an under-served customer segment.

Numerous California agencies currently conduct DG-related technology development and commercialization activities, including the Energy Commission's PIER and Renewables programs and the CPUC's self-generation program. No statewide programs, however, currently assist DG business development, specifically, although small business assistance programs exist within the Trade and Commerce Agency.

ROLE OF FEDERAL AGENCIES

The U.S. Department of Energy is the foremost federal agency promoting DG business and technology development. DOE's Distributed Energy Resources (DER) Program implements a *Distributed Energy Resources Strategic Plan,* which defines a national effort to develop the "next generation" of clean, efficient, reliable, and affordable distributed energy technologies. DOE also plans to document the energy, economic, and environmental benefits of using DER and to disseminate the findings; and implement deployment strategies, including national and international standards, that address infrastructure, energy delivery, institutional, and regulatory needs.

ROLE OF LOCAL GOVERNMENT

The role of local governments is also critical to future of DG in California. Permitting of DG is most likely to be performed by local governments. As such, local governments will need access to information that will assist them in making these permitting decisions. Some local governments conduct DG-specific economic development activities. For example, the nation's largest jurisdictions — including San Carlos, San Diego, Long Beach, San Francisco, Santa Monica, Santa Rosa and San Jose — comprise the Urban Consortium Energy Task Force, whose current agenda includes DG building permit streamlining.

Local government facilities offer ideal settings for demonstrating DG technology, because public institutions can tolerate longer payback periods than private businesses and their demonstration sites are visible to local residents and businesses. A number of California cities and counties are now installing DG projects, with assistance from the Local Government Commission and the Energy Commission.

The San Diego Regional Energy Office is taking a comprehensive look at the region's energy issues and options and developing a regional energy infrastructure plan. The planning scenarios include both moderate and aggressive deployment of DG. Traditionally, utilities and state agencies have conducted energy infrastructure planning, with little or no local government involvement. Local governments, however, have land-use authority that can be used to express preferences toward local, small-scale electric generators for meeting their future energy needs.

Publicly owned utilities—either special districts or energy departments within municipal government—also play an important role in California's DG future. They have long recognized the relationship between local economic development and affordable electric service. In fact, energy-intensive industries typically target municipal utilities for plant locations. Publicly owned utilities use their relatively low-cost electric rates as a competitive advantage to attract new businesses to their service territories. In addition, publicly owned utilities conduct demand-side management programs (e.g., energy audits and project financing) to retain existing businesses and to enhance customer satisfaction. Some publicly owned utilities have partnered with industrial customers to build cogeneration facilities, which add new electric supply to the utility's resource mix. They also work with homebuilders to offer solar photovoltaic systems to potential homebuyers.

VISION, MISSION, AND PRINCIPLES

Distributed generation gives you control.[28]

Vision	**Distributed generation will be an integral part of the California energy system, providing consumers and energy providers with safe, affordable, clean, reliable, and readily accessible energy services.**
Mission	**Energy Commission shall lead a statewide effort, which promotes and deploys distributed generation technologies to the extent that such effort benefits energy consumers, the energy system, and the environment in California.**

In September 2000, DOE released its *Strategic Plan for Distributed Energy Resources*, outlining principal objectives of the federal government through 2020. DOE's plan contains the following vision statement: "The United States will have the cleanest, most efficient, and reliable energy system in the world by maximizing the use of affordable distributed energy resources." To support the vision, DOE will lead a national effort to develop "next generation" DG technologies, document their environmental benefits, and implement deployment strategies.[29]

DOE's strategic plan objectives are consistent with DG activities now underway in California. For example, many RD&D projects funded by PIER seek to increase the efficiency of DG technologies while reducing their emissions. The Energy Commission and CPUC have sought to remove a major regulatory barrier by standardizing interconnection rules in California. While similar to DOE's statements, the Energy Commission's vision and mission statements are more conservative, reflecting the need to address the technical and market considerations before committing to the long-term vision and mission. If we determine that California energy consumers can benefit with distributed generation, we would be inclined to fully support wide-scale deployment.

This report's development and policy recommendations are based on the following principles:

- Deploy distributed generation only in ways that preserve and enhance the environment in which people live.
- Recognize the need for private investment. Without it, a self-sufficient distributed generation industry will never develop.
- Provide consumers more choices about how to meet their energy needs, including opportunities to gain more control over energy use and expense.

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28 Comment made by Dennis Roundtree at the Silicon Valley Manufacturing Group Distributed Energy Workshop, March 5, 2002.

29 Source: U.S. DOE, *Strategic Plan for Distributed Energy Resources, September 2000, Page 2.*

STRATEGIES AND GOALS FOR THE ENERGY COMMISSION

This section represents the heart of the Energy Commission's DG strategic plan. It first outlines the general strategies, including both leadership and collaborative opportunities, and the DG-related activities, which are currently being conducted by the Energy Commission. Then, this section presents near-term, mid-term, and long-term goals. The timeframes identified for each category of goal represent by when the goal would be achieved. For example, a near term goal would be accomplished within the next three to five years. In addition to listing goals, the plan identifies specific activities that would be conducted by the Energy Commission—in collaboration with state agencies and others—to realize the goal.

GENERAL STRATEGIES

Any distributed generation strategy endorsed by the Energy Commission must be consistent with the basic tenets established in the Warren-Alquist Act, legislation passed in 1974 which established the Energy Commission. In particular, Section 25400 of the Act states:

> *The Commission shall encourage the balanced use of all sources of energy to meet the State's needs and shall seek to avoid undesirable consequences of reliance on a single source of energy.*

Distributed generation clearly falls within the context of alternative sources, both from a generation and consumer choice framework. Our general framework for developing strategies towards the deployment of distributed generation is based on the following policy objectives:

- **Emphasize End-Use Efficiency Improvements** – *Affect supply and demand concurrently.* Efforts should be directed toward optimizing end-use energy under a "systems" approach, whereby a combination of demand reduction and self-generation options can accommodate the increased demand for electric service. It makes no sense to add on-site generation to power inefficient electrical appliances. At the same time, it may be more acceptable to a facility owner to participate in a utility load-shedding program if the facility can continue operating selected equipment using distributed generation, thereby reducing peak electric demand with no loss in productivity. When used together, energy efficiency, energy storage and self-generation technologies are called "distributed energy resources."

- **Promote Resource Planning at Both the State and Local Level** – Electric utilities should explore a wider array of options to meet increasing demand for energy service when performing electric distribution or transmission system planning. Included in this exploration are not only the traditional means (i.e., re-conductoring), but also utility-owned or customer-owned DG generation and storage options. In light of the recent events in California related to the energy crisis, the notion of integrated resource planning has once again emerged as desirable for the state to undertake. DG must be part of that evaluation.

- **Promote Cogeneration** – This is the most efficient DG application overall. System should incorporate thermal in addition to electrical requirements to reduce the amount of wasted energy. That way, electricity becomes a by-product of the heat produced. Also, by displacing space/water heating or process heating, cogeneration offsets one or more fuels. This provides a hedge against rising fuel prices.

- **Diversify Technologies** – Whatever solution is selected to meet future load growth, don't rely too heavily on one particular technology. Over-reliance on one technology or one form of electric generation should be mitigated.

- **Diversify Energy Sources** – While diversifying among different technologies, be aware of the potential risks of concentrating on one or a few fuel sources (e.g., natural gas). Limit fuel source risk by diversifying among technologies that utilize different fuels or can utilize multiple fuels.

LEADERSHIP OPPORTUNITIES

The Energy Commission's legislative mandates provides it with authority for taking a leadership role in some of the identified DG policy and program areas. Specifically, the Energy Commission has been tasked with the following DG-related activities:

- Public Interest Energy Research
- Renewables Program
- Building Energy Efficiency Standards
- Power Plant Licensing

Both PIER and the Renewables Program have at least ten years of utility-ratepayer "public goods charge" funding available to conduct technology development and commercialization activities. In addition, these programs allocate portions of this funding for research on the environmental impacts of new technologies, technology transfer and consumer education activities, respectively. Furthermore, the amount of funding available to conduct technology development and commercialization activities is significant relative to other State energy office programs.

The Energy Commission also has two regulatory programs, which could be used to implement a distributed generation policy agenda. The Building Energy Efficiency Standards affect both new construction and major remodels in the residential and commercial building sectors. These standards are updated every three years to reflect advances in the cost-effectiveness of energy efficiency technology. These technologies can either be mandated to be installed in all new construction or they can be recognized as "compliance options." The Energy Commission has the opportunity to recognize distributed generation's potential for reducing electric load growth that must now be supplied by the grid.

The Energy Commission's power plant licensing jurisdiction does not cover distributed generation facilities, but during power plant siting cases, the Energy Commission must evaluate alternatives to the proposed project. Distributed generation is typically discussed in the "alternatives analysis" of Preliminary/Final Staff Assessments. Currently, the methodology used to perform these assessments is narrowly focused on alternative technologies at the project site. In the future, the Energy Commission could develop new methodologies that expand the analysis to the technical and economic feasibility of DG deployment within the surrounding community.

Lastly, the Energy Commission has a number of internal resources which could be used to implement the technical/market analysis and customer education goals identified in this plan. These resources include the following:

- Geographic Information System mapping capability;
- Access to energy use data for use in region-specific supply and demand forecasting and the gas-infrastructure impact analysis;
- Expertise in environmental impact analysis of electric generation facilities; and
- Media and public communications capabilities, including a Web Site.

COLLABORATION OPPORTUNITIES

Other than the above-listed leadership opportunities, the Energy Commission desires to support other State energy agencies, local jurisdictions, electric utilities, or the federal government with distributed generation policies and program initiatives for which they have the lead.

As mentioned earlier, the CPUC and the Energy Commission continue to work together most effectively to develop interconnection standards. Putting these standards into utility tariffs was a major milestone. Now, monitoring implementation of these standards and modifying them when necessary, have become on-going responsibilities.

The interconnection standards were an outcome of the CPUC's distributed generation proceedings. In addition, Energy Commission identified ways to streamline environmental review and permitting of DG facilities. The *CEQA Review and Permit Streamlining Report* submitted to the CPUC in 2000 recommended conducting education services for city and county planning and building department staffs and air districts, but to date none of these recommendations have been initiated. The Energy Commission could partner with the Urban Consortium Energy Task Force, the Local Government Commission, and other local government organizations to bring these services to California jurisdictions.

DG project financing is available from private sources as well as a number of state and federal programs. State programs include the CPUC's self-generation incentive program, the Energy Commission's Renewable Buy-Down program, the State Assistance Fund for Energy, Business and Industrial Development Corporation (small businesses and non-profits only), and the Energy Commission's Energy Conservation Assistance Act (ECAA) loan program (public agencies and non-profits only). A publication has been offered for sale which lists all available government financing programs for DG, but it is not California specific and will be come out-of-date when the CPA sells its first bonds for industrial DG applications. The CPA and Energy Commission are currently working on how to expand ECAA with CPA revenue-bond funds. In the future, the Energy Commission could maintain a database of utility, public and private sources of funds for distributed generation projects and business development, making this information available on its website.

DOE's strategic plan identifies a number of research initiatives to accelerate technology development of distributed generation in the areas of efficiency, reliability, cost-effectiveness, interconnection ease, emission rates, and other necessary improvements. The Energy Commission's PIER program coordinates its research agenda with the DOE program and other public and private entities to leverage state funds when possible and to avoid duplication of efforts.

Another area of potential collaboration with the DOE program is technical training for DG equipment installers and operations and maintenance personnel. For example, the California Legislature tasked the Employment Development Department (EDD) to develop training curricula for solar photovoltaic installers, but did not provide any funding for EDD to do this work. The Energy Commission has an interest in helping EDD locate curriculum-development funding. Recently, DOE published information on its work with the Florida Solar Energy Center to develop PV installation curriculum. The possibility of an interagency collaboration could be initiated to help EDD accomplish its training mandate.

Collaboration with private sector organizations should also be pursued. For example, the Energy Commission and the California Manufacturers and Technology Association (CMTA) previously agreed to survey CMTA's members to identify which members are interested in considering DG projects at their facilities. Similarly, the Silicon Valley Manufacturing Group supports end-user surveys, workshops, and outreach meetings to help identify their membership's needs, so that training, and technical and financial assistance programs can be developed to meet those needs.

CURRENT ENERGY COMMISSION DG-RELATED ACTIVITIES

A brief review of present DG-related activities at the Energy Commission is warranted. Presently, the Energy Commission conducts distributed generation-related work among three of its technical divisions. Distributed generation is one of several focus areas of the PIER program, representing approximately 20 percent of all funding since the program's inception in 1998. As of mid-March 2002, 78 projects are identified with distributed generation, spread across the six program areas. Eight of those projects have been completed, with another 61 projects ongoing and nine more planned. Most of the portfolio is focused on reducing environmental impacts and reducing the cost of generating electricity. The most diverse range of projects, however, is found under the Energy Systems Integration (ESI) program area, with projects focusing on interconnection issues, market integration, grid effects, and market structure.

FIGURE 1
PORTFOLIO OF PIER PROJECTS ADDRESSING DISTRIBUTED GENERATION ISSUES

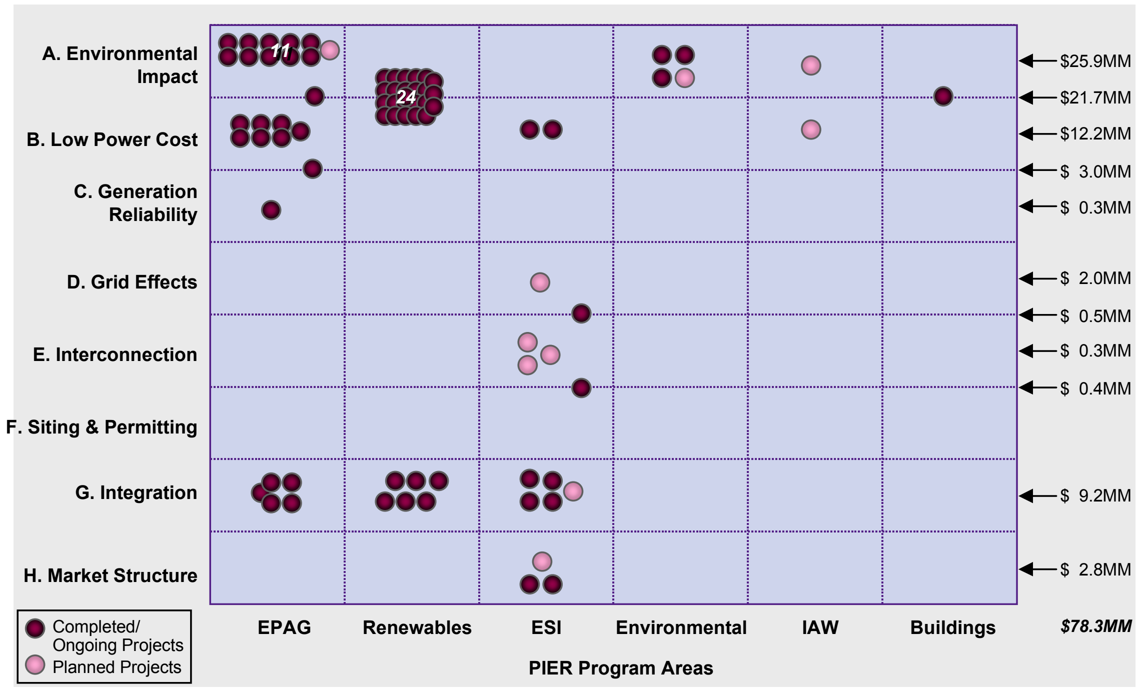

Figure prepared by Arthur D. Little, April 2002.

In total, more than $78 million in distributed generation projects are associated with PIER-related funding. A portion of the funding is related to technology transfer services, most notably technical assistance to the Energy Commission for the development of standardized interconnection rules and the enhancement of the Energy Commission distributed generation Web Site.

The Renewables Program has also provided a significant level of funding to support distributed generation projects. Different from the PIER funding, however, the funding offered under the Renewables Program is for products commercially available today. The Renewables Program invests in new and existing renewable power plant projects, provides purchase incentives for specific renewable distributed generation technologies, provides customer credits to "green energy" buyers, and conducts consumer information, outreach and marketing efforts.

Since the inception of the program in 1998, the Energy Commission has awarded more than $25 million in renewable distributed generation (photovoltaics, wind, solar thermal energy). Through early 2002, more than 2,000 systems have been installed for California consumers. With the signature of Assembly Bill 995 and Senate Bill 1194 by Governor Davis in September 2000, the program will continue through the year 2012.

In addition to providing financial support, the Renewables Program conducts consumer education and outreach to increase awareness about renewable energy options and to increase purchases of renewable distributed generation technologies. To date, the Renewable Energy Marking Board and its coalition partners have conducted grass roots and media events in targeted communities throughout the state. Market research was conducted to better understand the market for renewable distributed generation technologies. And, grants were awarded to various entities and organizations to support local consumer education and outreach activities. Currently, the Renewables Program is conducting a statewide Renewable Energy Public Awareness Campaign. Other anticipated activities to address market barriers affecting renewable distributed generation technologies include the following: training, education and outreach for local building department personnel and inspectors, building contractors, installers and engineers to lower the costs of system design and installation, reduce delays in permitting, and to improve installation quality.

Beyond the PIER and Renewables programs, distributed generation activity can be found to a lesser degree in other areas. The Energy Efficiency and Demand Analysis Division performs feasibility studies and provides project financing for public institutions. Energy efficiency projects can include combined heat and power. The Division is also responsible for residential and non-residential energy efficiency standards. Measures can be mandated if found to be cost-effective.

The Energy Commission's PLACES[3] program focuses on local government land-use planning practices and may lead to land-use policies that reduce permitting requirements (and associated environmental review) for DG applications. During power plant siting cases, Commission staff must prepare alternatives analyses for staff assessments. DG technologies are discussed as alternatives.

In summary, virtually all of the funding afforded to distributed generation projects is provided at the research or non-commercial level. While some funding for commercializing technologies are available, the Energy Commission has not placed great emphasis on that element of industry development.

GOALS

NEAR-TERM GOALS

We offer the following goals for the Energy Commission to accomplish within the next 3-5 years. Under each goal statement, we provide examples of the types of activities, which would be conducted to accomplish that goal. The Energy Commission will be asked to approve the allocation of staff and other resources to implement each activity through its regular work plan process.

#1: Establish a DG State Agency Coordination Group to cooperatively address distributed generation issues and ensure consistent handling of these issues throughout State government.

A variety of State agencies currently undertake distributed generation activities. Interagency coordination, however, is virtually non-existent except for the interconnection work and incentive programs developed under a close collaboration between the Energy Commission and the CPUC. The purpose of this goal is to create statewide agency coordination group to better coordinate DG activities. The group would meet on an ad hoc, as needed basis.

This activity is consistent with the following section of the Warren-Alquist Act:

> *The Commission and the other state agencies shall, to the fullest extent possible, exchange records, reports, material, and other information related to energy resources and conservation and power facilities siting, or any areas of mutual concerns, to the end that unnecessary duplication of effort may be avoided.*[30]

During the third quarter of calendar year 2002, the Energy Commission will solicit interest among State government agencies in creating a DG State Agency Coordination Group. The principal objective of the group will be to ensure that government programs are coordinated across all State agencies, so that program overlap is minimized if not eliminated entirely. The group would meet on an as-needed basis. Furthermore, this interagency group will solicit input from the California Alliance for Distributed Energy Resources (CADER). CADER consists of representatives from all aspects of distributed energy resources industry, such as technology manufacturers, project developers, regulatory and policy making bodies, environmental and consumer groups and local government organizations. In its non-advocacy role, it is considered a neutral source of information related to the industry.

#2: Raise consumer awareness about distributed generation by creating and maintaining a central repository of distributed generation information.

The Energy Commission plays a critical role in providing consumers with access to a wide variety of information about distributed generation technologies, applications, and programs through its Distributed Generation Guide, located on the Energy Commission's Web Site.
(See < http://www.energy.ca.gov/distgen/index.html>.) The Web Site also provides linkages to other DG Web Sites.

To enhance the value of the information disseminated to the public, the Energy Commission will perform the following activities:

a. Develop a database of all DG installations in California and publish non-confidential information on the Energy Commission's Web Site.

The database would contain information on where DG is being installed and what types of technologies are being used. The information would be used by government and industry to evaluate the market penetration of DG over time and to forecasting growth of DG markets.

The investor-owned utilities currently provide information to the Energy Commission about interconnected DG facilities. In addition, the PIER Environmental Research program conducted an inventory of diesel engines of 300 kW or greater installed for emergency generation, which is posted on the Energy Commission's Web Site. This emergency generator inventor is updated semiannually. To implement this database project, the Energy Commission will need help from city and county building departments and from DG equipment manufacturers. The Energy Commission is sensitive to the utilities' concern that this project not impose new reporting requirements on them.

[30] Section 25224 of the Public Resources Code.

b. Publish up-to-date information on the Web Site about distributed generation technologies, including following characteristics:

- Environmental factors, including air quality, noise, water supply, biological impacts
- Efficiency
- Reliability
- Commercial availability
- Installation and operational costs (without direct or indirect incentives)
- Communication/Control/Aggregation

The Energy Commission used to publish an *Energy Technology Status Report (ETSR)* on a variety of electric generation technologies. This activity would provide ETSR-like information. In addition to providing information on the commercial readiness of the various DG technologies, this activity would summarize final research results from selected PIER Renewables and Environmentally Preferred Advanced Generation projects.

#3: Develop and conduct targeted consumer education campaigns.

The utilities have suggested that an education program is needed to protect consumers from unfair or abusive marketing practices by DG project developers. The Energy Commission has been unable to identify examples of such practices. As a preventive activity, however, the Energy Commission's Web Site provides information on interconnection standards and eligibility criteria for participating in the Energy Commission's Renewables Buy-Down program. Additional information could be added to the Web Site, based on an analysis of unmet needs.

Others have suggested the need to conduct targeted consumer education programs about DG. Suggested target audiences including the building industry (e.g., homebuilders), public agencies (e.g., as potential adopters of DG technology) and members of communities in which a proposed DG project is subject to a full environmental impact report. The Energy Commission will work with other State agencies to seek state and federal funding to conduct such training and outreach programs.

#4: Fund research, development and demonstration programs to advance the development and deployment of distributed generation technologies.

As mentioned earlier in this plan, the heart of Energy Commission work addressing distributed generation is conducted through its research, development and demonstration program, called PIER. In addition to technology RD&D, this strategic plan envisions the following activities to help integrate DG into California's electric system:

a. Conduct research, modeling, and testing to assess how wide scale deployment of distributed generation might affect the electricity grid.

The strategic plan's outline raised a number of questions about the effects of interconnecting substantial amounts of DG on the distribution systems, both radial and networked, including safety, reliability and cost concerns. Stakeholder comments supported the need for research in this area. Utility comments noted the importance of field tests to collect actual data. Research in this area will address several questions, including but not limited to the following: How does bulk deployment of DG affect reliability in localized areas? What are the effects of DG on service restoration following an outage?

b. Conduct research on the potential impacts on populations and the environment from the implementation of DG technologies.

For the Energy Commission to promote environmentally acceptable DG technologies, research is needed to identify potential impacts of deploying particular DG technologies. The Energy Commission's current research plans include determining the air emission characteristics of existing and future DG technologies and the associated public exposure from these emissions. This research includes developing better monitoring and modeling techniques to assess ground level concentrations of air contaminants associated with DG installations. Through analysis of DG penetration and use, research will begin to predict the effect that these systems will have on public health and the environment.

c. Conduct research that can be used by CARB in its 2005 mid-term review of air quality regulations adopted pursuant to California SB1298 (Statutes of 2000).

The Energy Commission's current research will likely provide some insight on what is needed to meet distributed generation air emissions regulations and the cost to meet the regulations. This information is consistent with the desire of CARB to undertake a mid-course review of the regulation in 2005. Energy Commission activities can assist CARB in that endeavor. The Energy Commission can help identify DG technologies and control technologies that are needed for DG to become as clean as central station power plants by 2007, thereby meeting CARB certification requirements.

d. Conduct research on "virtual energy networks."

The notion of a virtual energy network has been raised but not fully addressed. Research needs to be performed to understand the potential value that virtual energy networks can provide to the electricity system, beginning with a clear definition of a "virtual energy networks" or "distributed power plants." Research developing communications equipment will be paramount to this effort.

e. Conduct research on the technical and economic feasibility of microgrids.

Microgrids, like virtual power parks, are drawing increased attention in the distributed generation community. The Energy Commission is committed to investigating microgrids and their potential role in the electricity market. Workshops held at the Energy Commission in May 2002 began this process, assessing the technical, economic, and regulatory implications of owner-tenant microgrids.

f. Assess utility distribution system design philosophy.

How can design tools be modified to accommodate the growing demand for DG so that interconnection can be streamlined and so that DG can become an integral part of the utility distribution system, where appropriate?

g. Assess the "value propositions" that DG could provide to energy consumers and the power system. Determine the best market and regulatory structures needed in California to enable DG to succeed.

The long-term success of DG will rely on highly integrated relationships and interactions between suppliers, operators and customers. It is too early to tell which business models—and the value networks that they represent—will succeed. The current lack of successful business models, however, prevents significant private industry investment, obscures a clear path for technology development, and creates difficulty in understanding and setting priorities for necessary regulatory changes.

Developing these value networks requires answering the following and other questions:

- What is the role of the utilities – active participant or bystander?
- Should DG be controlled centrally or locally?
- How do DG installations great value for the power system? How are these DG projects compensated for that value?
- What does the customer value? How could a DG project provide that value? How would the customer pay for that value?
- How is risk allocated in each business model?

The analysis of possible value networks will reveal the most attractive value networks from an energy and public policy perspective, and the regulatory/policy conditions and infrastructure necessary to encourage selected value networks to come to fruition.

#5: Assess the market, technological and regional potential for distributed generation in California to determine a reasonable goal regarding electric generation capacity additions from DG by 2020.

This goal addresses an outstanding question about what should be an appropriate long-term goal for DG in California. The U.S. Department of Energy's *Strategic Plan for Distributed Energy Resources* set a mid-term goal which stated that, by 2010, distributed generation would represent 20 percent of new electric capacity additions in the United States.

The draft version of this strategic plan contained the following, similar goal for the year 2020: 20 percent of all incremental generation will be DG. The numerical goal in the draft plan was based on DOE's goal, but the California goal would have allowed the State ten more years to achieve it. We received negative feedback, however, about setting numerical goals before the Energy Commission has conducted a detailed assessment of the total costs and benefits of DG, relative to those of central station power plants and transmission lines. It was argued that Energy Commission could not conclude that *any* percentage of DG was appropriate in California's energy resource mix until after an assessment was done.

The vision stated in this strategic plan is for DG to become an integral part of California's electric system, not for it to become the sole alternative to central station power plants and transmission lines. A little-apples-to-big-apples comparison, therefore, would be inconsistent with the vision statement.

We do agree, however, that numerical goals must be based on objective analyses of the current status of DG installations, a reasonable forecast of installations given current regulatory and market environments, and the likelihood that government activities can positively affect future DG adoption rates. The following activities seek to provide the analysis necessary to support a reasonable DG goal:

a. Conduct distributed generation forecasts as part of the Energy Commission's on-going energy supply and demand forecasting activities.

Presently, distributed generation is not regarded as a supply-side resource. Instead, DG is embedded into the Energy Commission demand forecast as a form of demand reduction. It may be possible, once the database of DG installations has been completed, to spot trends and to forecast DG as a supply-side resource. (Note: The database is described under Goal #2.)

b. Assess potential impact on natural gas infrastructure from widespread deployment of DG.

The effects of expanding gas facilities to support gas-fired DG technologies and its impacts on natural gas supply and pricing in California should be assessed. Some of the questions needing consideration include but should not be limited to the following: What are the implications of higher levels of DG on natural gas markets? How would the widespread use of gas-fired DG impact the wholesale natural gas market and natural gas distribution infrastructure? In comparison between DG and central station power plant, lower thermal efficiency and higher emissions of DG is noted. If the central station power plants are remote (e.g., Blythe), however, how much of the electricity is lost over the transmission and distribution system before it reaches the point of use? How does this plant's total costs, including line losses, compare to the total costs of a DG unit located near the point of use?

c. Assist local governments, which are developing local/regional energy infrastructure plans.

Local jurisdictions, including those in the Bay Area and San Diego, are currently developing energy infrastructure plans. In most cases, these energy plans reveal preferences for more aggressive deployment of energy conservation, peak-demand management, renewable energy resources and natural-gas-fired distributed generation. The Energy Commission will serve as an information source for these jurisdictions to assist them with their planning efforts. It is envisioned that the types of analytical work needed by local jurisdictions is in determining both the technical and economic potentials for both demand-side and small-scale electric generation in their regions.

#6: Identify and address institutional and regulatory barriers, which are interfering with the purchasing, installation, and operation of distributed generation facilities.

a. Participate in policy debate regarding DG market design, utility ownership, utility tariffs, demand charges, standby charges and exit fees.

Addressing financial issues surrounding the resolution of the California energy crisis has raised major policy issues regarding whether utility tariffs and, most notably, whether exit fees and grid management charges will be assessed to self-generation customers. Proponents of distributed generation argue that the imposition of these fees on a "departing load" customer using distributed generation will make many of these projects uneconomic. As such, deployment of distributed generation is severely hampered.

On the other hand, parties argue that all consumers should be financially responsible for repayment of energy-crisis related costs. As the debate on these issues proceed, it is important to investigate approaches that balance the need to recover energy crisis costs and the ability to effectively deploy distributed generation. The Energy Commission believes that a comparison of California tariffs and other utility charges with other states deploying distributed generation is necessary, in order to determine the potential impact that certain rate design policies might have on DG project cost-effectiveness. Recognizing that many of these issues have been addressed by the CPUC in its distributed generation proceeding, additional analyses should not overlap with that work as these results can be incorporated into the DG activities of publicly-owned utilities.

Additionally, based upon findings from the grid effects and value network analysis, the energy Commission should work with appropriate regulatory bodies within State government and the Legislature to foster a business environment where DG businesses can profit, thereby enabling DG installations to contribute to the state's energy resource mix.

b. <u>Continue to develop and implement interconnection rules.</u>

The Energy Commission remains committed to the development of standardized interconnection rules across California. As part of that effort, we will continue to oversee the Rule 21 working group and monitor utility implementation of interconnection standards. We will also investigate: a) whether potential DG installations have been postponed or abandoned due to existing or prior interconnection rules or costs; b) approaches for eliminating, standardizing or streamlining the work associated with conducting engineering studies of interconnection; 3) enhancing the distributed generation equipment certification program; 4) creating documents and tools that will explain the interconnection process; and 5) educate city and county building departments about the interconnection process, so that they can help with the consumer education process.

c. <u>Support publicly owned utilities' adoption of Rule 21 interconnection standards.</u>

Since publicly owned utilities serve approximately 15 percent of the state's electricity consumers, statewide interconnection rules cannot truly be standardized without a wholesale approval of Rule 21. The Energy Commission has performed outreach services to the public-owned utilities with the intent of assisting with using consistent interconnection rules and recognizing the jurisdictional differences between their constituency and CPUC rules. The City of Riverside is the first non-CPUC-regulated entity to adopt a similar rule, with other utilities giving serious consideration to doing the same.

d. <u>Support IEEE certification efforts.</u>

Since Rule 21 relies heavily on interconnection standards being developed by IEEE, the Energy Commission should take steps to ensure that Rule 21 is modified to accommodate modifications to IEEE standards at the national level. At present, the Energy Commission retains individuals actively involved in the IEEE P1547 process, including those involved in the direct write-up of the standard.

e. Participate in policy debate surrounding net metering issues.

Net metering is a special metering and billing agreement between an electric utility and customer. Normally, an electric meter spins forward to measure electrical use only and a monthly reading of the meter is reflected in the utility bill. Special net meters, however, are capable of spinning both forward and backward to measure both on-site electric generation and use. If the customer has an on-site electric generator that is connected to the grid, and if that generator produces more electricity than the customer uses, then the meter shows the net amount of electricity purchased from the utility. Net metering is a simple way to receive the value of the generated power at the customer's retail electric rate.

Currently, only residential and small commercial electricity customers may participate in net metering programs. And, the only types of on-site generators which may be installed under net metering programs are solar, wind energy, or a combination of both. Furthermore, net-metered systems which are greater than 10 kW but less than one megawatt must be installed by December 31, 2002 to participate in net metering programs. After that date, the size of the eligible generating unit will reduced to a maximum of 10 kW, unless this deadline is extended or eliminated by statute.

To support the decision about whether to expand net metering programs and how to expand or modify them, an evaluation of the results of the current net metering programs needs to be conducted to determine if the net metering programs have been successful in achieving their objectives. An evaluation of the net metering program would enable policy makers to determine the potential impacts of expanding eligibility to other classes of utility customers or other types of DG technology.

f. Participate in policy debate surrounding gross versus net metering issues.

This activity would address issues raised by Cal-ISO during the strategic plan's development, regarding the relationship between DG, grid reliability and Western Systems Coordinating Council (WSCC) and North American Electric Reliability Council (NERC) minimum operating reliability criteria (MORC). Provide proof to WSCC of DG's grid reliability benefits. Cal-ISO requirement for gross metering of generation and load, and use of gross metering data as the billing determinant for ancillary service charges, grid management charges, and transmission access charges. "Harmonization" of state and federal requirements: potential use of gross metering data used for purposes of retail requirements and settling retail charges as well.

g. Support and monitor programs designed to aggregated DG loads.

With the suspension of direct access in California, a viable approach to improve the economics of a distributed generation project has been removed from the evaluation of a self-generation project. Similar to a pilot project created by the California Independent System Operator, the Energy Commission supports aggregated programs that provide self-generation customers with a wider array of options for utilizing the technology. In March 2002, the ISO initiated a pilot aggregation program that sought to schedule up to 10 megawatts of distributed generation along the ISO grid. While the ultimate success of that program has yet to be determined, the Energy Commission believes in the concept. As such, we envision working with the ISO or other entities to develop similar programs to determine whether load aggregation is viable for self-generation customers with excess power available for sale.

h. Develop and conduct targeted technical training programs for local jurisdiction permitting staffs.

The Energy Commission's report entitled, *Distributed Generation: CEQA Review and Permit Streamlining,* recommended that the Energy Commission conduct targeted training programs for city and county planning and building department staffs and air district permit staff to help streamline local jurisdiction permitting processes. This activity would implement that Commission-approved recommendation.

#7: Provide financial and tax incentives, which encourage the voluntary deployment of commercially available distributed generation technology, as appropriate.

The Energy Commission's Renewables Buy-Down program and the CPUC's Self-Generation program are the State's principal DG incentive programs currently available. The Renewables Buy-Down program is expected to continue through 2011. The Renewables Investment Plan is pending approval at the California Legislature. The CPUC, however, must still determine how the costs for providing incentives through the utility-administered Self-Generation program will be recouped through utility rates. In addition to these incentives, the state and federal governments provide tax credits, accelerated depreciation and property tax exclusions for selected technologies.

a. Provide state subsidies for renewable DG technologies through the Energy Commission's Renewables Buy-Down Program, according to the approved Investment Plan.

The Energy Commission will continue to implement its Renewables program. In addition, it will seek opportunities to improve the efficiency and effectiveness of this program through program evaluation and fine-tuning of its program design. Information on the Energy Commission's DG incentive programs and their eligibility criteria is provided on the Energy Commission's Web Site at <http://www.energy.ca.gov/renewables/index.html>.

b. Inventory all state and federal subsidies for DG technologies.

Some parties have expressed concerns that DG is over-subsidized and suggested that the Energy Commission analyze how to best use incentives as it relates to distributed generation. Some of the questions to address in such an analysis include the following: Are additional subsidies warranted? If so, for what purpose and for how long? What is the appropriate role of government in encouraging and/or subsidizing certain DG technologies versus other available means of balancing supply and demand and ensuring reliability of the transmission and distribution systems if the state?

c. Provide technical support to the State Franchise Tax Board regarding implementation of tax credits related to DG.

The Energy Commission's Renewables Program already provides on-call support to staff of the State Franchise Tax Board to help implement the solar tax credit, which is now available for the purchase and installation of a solar energy system.[31] The Energy Commission is committed to assist in the development of future tax credit programs on an as needed basis.

MID-TERM GOALS

We offer the following goals for the Energy Commission to accomplish within the next five to 10 years.

#1: Reduce distributed generation equipment costs to a level that would obviate the need to provide government incentives to deploy distributed generation.

#2: Enhance the emissions and efficiency profiles of distributed generation technologies, monitoring and modeling techniques, DG technologies, and cost-effective control technologies such that the resulting environmental impacts, public exposure, and permitting support wide-scale deployment.

#3: Establish markets that pay for the full value of DG, including grid benefits, environmental benefits, greenhouse gas reduction credits, energy conservation, and waste reduction benefits.

#4: Certify and deploy DG systems in such a way that procuring distributed generation is as routine as purchasing appliances for the home.

LONG-TERM GOALS

The following goals would be accomplished within 10 years.

#1: Make California's energy generation and delivery system the cleanest, most efficient, reliable, and affordable in the nation by maximizing appropriate use of distributed generation.

#2: By 2020, ___ percent of all incremental generation will be DG. (See Near-Term Goal #5).

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31 For tax years beginning 2001 - 2005, a tax credit is available equal to the lesser of 15% for tax years 2001 - 2003 or 7½% for tax years 2004 - 2005 of the net cost paid to purchase and install a solar energy system for the production of electricity, or $4.50 per rated watt of generating capacity of that system.

GUIDANCE TO OTHER STATE AGENCIES

The Energy Commission recognizes that realizing the full intent of this strategic plan will not be possible without the close coordination and mutual cooperation of our sister agencies across the state. With resources limited, the synergies of working on a common direction represents good public policy and provides an opportunity for the state to spend its taxpayer dollars most effectively. The synergies of developing a well-coordinated program are paramount to the success of this plan.

As a starting point, we stress the importance of actively participating in a state agency distributed generation working group. Agencies we anticipate being part of the group include but are not limited to the following:

- California Air Resources Board
- California Public Utilities Commission
- California Consumer Power and Financial Authority
- Department of General Services
- Employment Development Department

Since we do not have statutory authority to require participation by other agencies, it is critical that each agency participate willingly and should do so to the extent that their involvement will improve related distributed generation activities in California.